

**REMARKS ARGUMENTS**

Claim 25 stands rejected under 35 USC 112, 2nd paragraph, as allegedly unclear how the water-borne, water-dispersible, or water-soluble resin or mixtures thereof could possibly be 99 wt% since the minimum of the remaining components is greater than 1 wt%, i.e., 1.03 wt%.

The Examiner should note that the amounts of the listed components are shown to two significant figures. Thus, when the components other than the resins are totaled to the "1.03" amount leaving "98.97 wt%" for the resin, the "98.97" amount was rounded off to two significant figures of "99". One skilled in the scientific arts clearly understands the process of rounding off to significant figures. Applicants submit that there is no 112 defect with regard to claim 25 and request reconsideration and withdrawal of the rejection. In the alternative, Applicants would be willing to amend the claim to recite "98.97 wt%".

The subject matter of each pending claim was commonly owned by assignee because each co-inventor was under an employment contract to assign inventions.

Claim 27 stands rejected under 35 USC 102b as anticipated by or, in the alternative, under 103a as obvious over US 4,311,618. The Examiner has cited Example 5 of the reference for disclosing the claimed components in an aqueous cleansing solution. As noted at Col 1/15+, US '618 teaches aqueous cleanser compositions for removal of residues of biological materials from laboratory equipment. There is no teaching or suggestion in this reference regarding the defoaming aspects of the alkyl glycidyl ether-capped polyamine compounds of the present application.

Nevertheless, Applicants have amended claim 27 to be in the Jepson format, reciting in the preamble that which is known in the prior art, i.e., aqueous fountain solution compositions, followed by the inventive improvement. Since the claim now clearly pertains only to aqueous fountain solutions used in lithography, the cited reference with regard to compositions for cleansing laboratory equipment is not at all relevant to the presently claimed invention. Because the presently amended claim recites a fountain solution composition, US '618 cannot make out a 102b rejection. In addition, since US '618 neither teaches nor suggest anything about defoaming, it cannot possibly make out a 103a rejection.

Attached is a copy of an article entitled, "The Function of Fountain Solution in Lithography."

Although the foam control function may be inherent in compounds disclosed in the reference, such inherency cannot be used as a basis for an obviousness rejection. MPEP 2141.02 under the section headed DISCLOSED INHERENT PROPERTIES ARE PART OF "AS A WHOLE" INQUIRY, second paragraph, reads:

"Obviousness cannot be predicated on what is not known at the time an invention is made, even if the inherency of a certain feature is later established. *In re Rijckaert*, 9 F.2d 1531, 28 USPQ2d 1955 (Fed Cir. 1993). See MPEP § 2112 for the requirements of rejections based on inherency."

MPEP 2112.01 states in part at 2112.01(II), "Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir 1990)." A prior art reference teaching a claimed compound is synonymous with a 102 anticipation of such compound and the argument of inherency with regard to properties of the claimed compound is applicable. Such anticipation-based inherency is not present in the instant case. Such anticipation-based inherency is not the law with regard to the claims that have been rejected under 103 as being obvious or suggested as opposed to being specifically taught. The Examiner has misapplied the understanding of inherency regarding a 102 teaching or anticipation rejection to a 103 suggestion or obviousness rejection.

The Examiner's position would never allow for any showing of unexpected results (in the present case a showing of foam control) to overcome an obviousness 103 rejection because the Examiner would say such showing is inherent and thus expected. Every 103 rejection is based on a single reference or a combination of references that makes obvious or suggests the claimed subject matter. To then argue that the claimed subject matter rendered obvious by such single reference or combination of references necessarily or inherently possesses or exhibits the claimed properties or unexpected results would preclude any possibility of ever overcoming such a rejection by showing unexpected results. Such is clearly not the case law.

In view of the above remarks and the amendment to Claim 27, Applicants request reconsideration and withdrawal of this rejection.

Claims 24-29 stand rejected under 103a as being unpatentable over US 5,939,476 in view of JP S52-10847 (translation provided by Applicants). The Examiner recognizes that

US '476 differs from the instant claims in the use of the presently claimed alkyl glycidyl ether-capped polyamines. US '476 used certain alkylated polyamines. There is no teaching or suggestion with regard to the invention of '476 that the alkylated polyamines are being used for any antimicrobial properties to mitigate bacterial or mold growth. The thrust of '476 is the use of the alkylated polyamines as surface tension-reducing agents even though there is a prior art reference disclosing these materials having antimicrobial properties. JP '847 discloses methods of making alkyl glycidyl ether-capped polyamines having antimicrobial or bactericidal properties for addition to bouillon culture mediums. There is no teaching or suggestion in this JP reference with regard to surface tension-reducing properties or defoaming properties of these compounds.

The Examiner alleges that the aqueous compositions of '476 would be prone to mold and/or bacterial degradation upon lengthy storage; however, this is merely speculation, and there is no evidence on record of such being the case. Therefore, there would be no reason to substitute the compounds of JP '847 into the aqueous compositions of '476 for antimicrobial purposes let alone for the expectation of reducing foaming as claimed in the present application. This expectation cannot be obtained from JP '847 because there is no teaching or suggestion with regard to defoaming, and as pointed out previously, inherent properties of compounds, if not taught or disclosed in some manner, cannot support a 103 obviousness rejection. The citation by the Examiner of *In re Papsech* for the proposition that a compound and all of its properties are generally inseparable is true and is case law with regard to claiming a compound already in the prior art and arguing patentability based on a newly-found property. In such instance it is case law that inherency applies to a 102b rejection.

In view of the above remarks, Applicants request reconsideration of this rejection and its withdrawal.

Claims 13-14, 18, and 24-29 have been provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 13-19, 23, and 25-29 of co-pending application 10/112,537.

Enclosed is a Terminal Disclaimer obviating this provisional obviousness-type double patenting rejection.

Enclosed is a copy of the Power of Attorney filed in the parent application to allow the undersigned attorney to deal directly with the Examiner.

Appl. No. 10/618,117

Believing this Application is in condition for allowance, Applicants solicit an action to that effect.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Michael Leach", written in a cursive style.

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Encl.

# **PressMax**

**THE FUNCTION OF  
FOUNTAIN SOLUTION  
IN LITHOGRAPHY**



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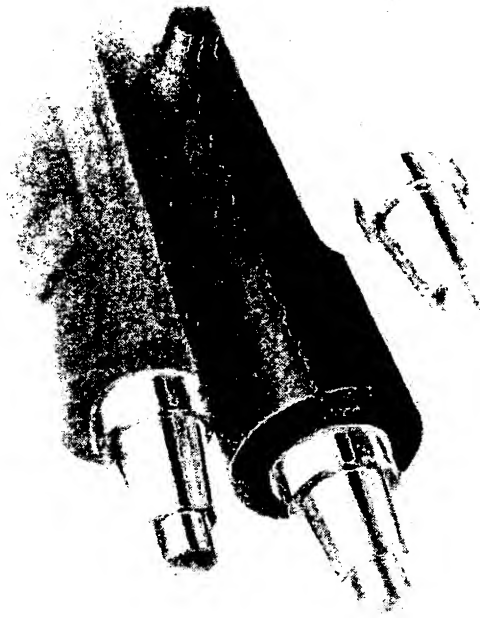
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## INTRODUCTION

We all view lithography as such an everyday phenomenon that perhaps you have not carefully thought about the role that water/fountain solution plays.

You might say that the answer is obvious, "Keep ink off the background areas while the press is printing and protect the plate when the press stops."

We'll respond with, "You are correct, but that is far from the complete story." Lithography is a complicated and often mysterious process, at least whenever it's not working well. This process is both physical and chemical in nature which means that a lot is going on. Later you will grasp both the chemical and physical aspects in greater detail.

We hope that you find this book to be interesting and helpful in your daily work. If you have any questions or comments, please feel free to call or write to us at:

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## THE FUNCTIONS

Let's begin with two simple observations; turn down the water and ink starts to print in the non-image, turn up the water and the ink starts to leave the image. You are seeing competition of both ink and water for image and background. When the process is working well it is said that the ink and water are in balance. Each surface is carrying a thin film of primarily the intended material. Notice that even though the two surfaces are very different, both can accept ink or water.

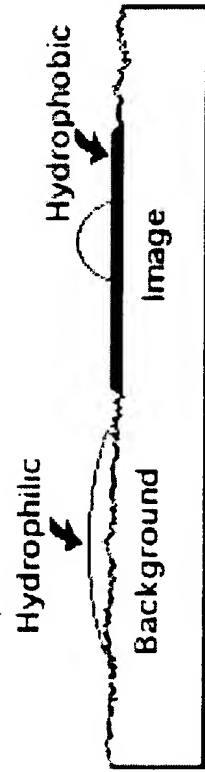
### Supply a Film of Water

If the plate is allowed to run too dry, ink will begin to wet the background and print and you will have what is called scumming. This occurs because there is not enough water to coat the plate surface completely, and the bare aluminum accepts ink.

Thus, function number one is to provide an adequate film of water.

### Desensitize the Background

There are important differences between the image and background surfaces which explain the physical process that makes lithography work.



Here you see two water drops. On the left the water spreads across the water-loving (Hydrophilic) background while on the Hydrophobic (water-hating) image, the water beads.

## THE FUNCTIONS

Think of the background as pulling out on its water drop, causing it to spread into a thin layer. The background surface is literally pulling outward with a kind of capillary action.

It is critical for fountain solution to maintain this hydrophilic surface of the background. However, the image is similar to a freshly waxed car. The water does not "wet" the paint (or image in this case) but only beads up, and the fountain solution must not convert the image to a hydrophilic nature (we call this blinding of the plate).

### Cleaning

The next example is not quite so simple. Ink up a dry plate, and we see that the ink sticks well everywhere; it "wets" both the image and the background. If it's a good plate and you gently rub the background with a wet pad, the ink will lift off and be displaced by water. The same capillary forces that caused the water to spread to a thin film will draw the water under the ink and "float" it off. If we had used fountain solution rather than plain water, the surface would be "cleaned" more efficiently. This cleaning process is critical during press starts.

### Rapid Spreading and Dampening Throughput

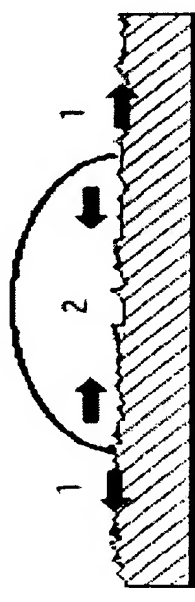
The fourth and fifth functions promote the water spreading on the background and rollers; fountain solution helps the water flow evenly and smoothly through the dampening rollers onto the plate. It is critical to achieve a thin, uniform film of water across the plate surface. This must happen quickly—in the time that the plate cylinder rotates from the dampening form roller to the blanket. On modern high-speed web presses, this time is very short (0.05 seconds at 1500 fpm).

## THE FUNCTIONS

The dampening rollers always impart nonuniformities similar to the ridges that a paint brush leaves before the paint has had a chance to "flow" out. This same "flowing out" must occur on the plate surface.

Additives are used to promote this rapid spreading and flow across the plate surface. They are called wetting agents or surface active agents (surfactants). These materials, when dissolved in your fountain solution, reduce the surface tension of the water. Look at how they work.

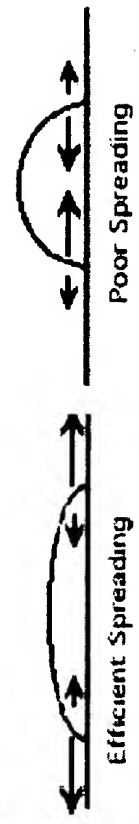
A vector diagram from physics makes this easy to understand. When a water drop is sitting on a surface there are two important forces (represented by the arrows) acting on the water.



**Force 1 - Surface Energy of the Plate Pulls Out**  
**Force 2 - Surface Tension of the Water Pulls In**

The balance of these two forces determines how easily the drop spreads. Fountain solution has a dual role affecting both forces. The surfactants (wetting agents) reduce the surface tension thus making the inward forces smaller. The desensitizers maintain the hydrophilic surface, thus increasing the outward forces. The net result is that fountain solution, when it's working well, promotes good spreading by increasing the outward forces and minimizing the inward forces.

## THE FUNCTIONS



On the left, observe the proper balance of forces; while on the right, the fountain solution is trying to bead up on the plate background. This plate may tend to be sensitive to ink.

### Lubrication

The sixth function is lubrication and anti-piling. Fountain concentrates should contain lubricants and "release" agents for the blanket. The film of water carried on the plate background retards friction wear, thus increasing plate life. This reduction of friction prevents the ink train and plate surface from over heating. It has been shown that paper lint and dried ink resin do build up on the blanket, and this is called piling or linting. The release agents help to prevent the blanket from becoming "sticky" thereby picking excessive paper lint.

### Emulsification Control

The final function is to help prevent excessive emulsification of water into the ink (formation of a water-in-oil emulsion). The ink maker designs his ink to print correctly after it has taken on some water. This "emulsified" water is essential to proper ink transfer and required to maintain open reverses.

It is also critical to not promote the formation of oil-in-water emulsions. This "oil-in-water" condition is what happens when the detergent in your washer takes oily soil off the clothing. The fountain solution must not break down the ink or it will pass into the water. If tiny ink or pigment particles are floating around in the water they can stain the background or print as a light tone.



## THE FUNCTIONS

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### Summary

The seven functions can be summarized as follows:

1. Keep ink off the background with a film of water.
2. Maintain the hydrophilic nature of the background.
3. Quickly clean ink off the background during press starts.
4. Promote fast spreading of water over the plate surface.
5. Help the water flow evenly through the dampening rollers.
6. Lubricate the plate and blanket.
7. Control emulsification of ink and water.

You can now imagine that to accomplish these tasks is much more complicated than just providing water to the background of the plate. In rare instances, water might work; but most printers would find it difficult to work with.

In the next sections you'll examine what chemicals are used and see in greater detail how fountain solution actually works.

## THE CHEMISTRY

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### Introduction

The fountain solution's assignments have been listed. By studying the chemistry and physics of fountain solution, you will better understand how the tasks are accomplished.

Most American fountain solutions are formulated in a somewhat similar manner; however, this is not to imply that they all perform equally well. There are many ways to accomplish the functions and some of these are much more efficient than others. The following are the major classes of ingredients used in fountain solutions:

### Ingredients

- Water soluble gums.
- A pH buffer system.
- Desensitizing salts.
- Acids or their salts.
- Wetting agents (also called surfactants).
- Solvents.
- Non-piling or lubricating additives.
- Emulsion control agents.
- Viscosity builders.
- Biocides (fungus, bacteria, and mold control agents).
- Defoamers.
- Dyes.

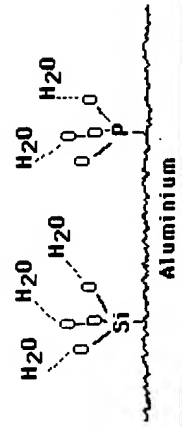
## THE CHEMISTRY

### Desensitizing the Background

Recall the discussion of the hydrophilic nature of the background. When the plates are manufactured, the aluminum surface is treated to be both durable and water-loving. As the plate wears and is constantly exposed to ink and dirt, this treatment must be renewed. Several ingredients contribute to this renewable desensitizing:

**Water soluble, film-forming gums**—gum arabic has been the choice of lithographers for many years. This is the dried sap of the acacia tree that grows in parts of Africa. This gum is very water soluble and has a high affinity for aluminum metal. It bonds best at pHs near four. Other water soluble polymers such as larch gum, starches, CMC, PVP, some acrylics and others have also found use as plate desensitizers. After each application of fountain solution, a small amount of gum adheres to the background providing a protective film. When the press is stopped for any length of time, it is very important that this gum film is adequate to protect the plate from oxidation or handling.

**Desensitizing salts**—several inorganic salts aggressively react with aluminum metal to form hydrophilic compounds. These salts all contain what are called strong polar bonds which attract water (hydrophilic, again). Examples are silicates (Si-O4) and phosphates (P-O4). Notice that both contain oxygen atoms (O); these polar oxygens will stick up from the plate surface and draw water.



## THE CHEMISTRY

Plates are often treated during manufacturing with these same salts following the anodizing to impart a durable, corrosion-resistant surface.

**Cleaners**—in a secondary role are acids, solvents and wetting agents. These act as cleaners and tend to remove any accumulated oily soil from the plate surface. If left to build up, this soil will attract ink and cause sensitivity. Acids, like phosphoric, are used for metal cleaning to "brighten" the surface. This is where the term "etch" came from. A very thin layer of metal, only a few molecules thick, is dissolved off the plate exposing a fresh surface.

### Cleaning the Background During Press Starts

Commonly, ink will get on the dry background when the press stops. Recall that ink will easily "wet" the non-image if it is dry. When the dampeners come back on, it's essential that the fountain solution displace this ink quickly. Minimizing waste is the name of this game! If conditions are right, the ink will almost instantly return to the ink forms, and the first sheet will then be clean. If the ink passes into the fountain circulator and forms an "oil-in-water" emulsion, the suspended ink can cause toning problems.

The sequence of events during a press shutdown and restart goes something like this:

1. The thin film of fountain solution dries on the plate.
2. Ink may get on the background after shutdown if the press is inched.
3. During restart, fountain solution is applied to the water form roller wetting the background.
4. The dried gum film should dissolve and lift off any ink or dirt.

## THE CHEMISTRY

5. The desensitizing ingredients will reestablish the hydrophilic layer on the background, and the plate will be printing clean.

A failure at any point will slow the restart and cause more spoilage. To sum up restarts:

- There must be a thick enough film of gum from the evaporating fountain solution.
- The gum film must be readily soluble when the water returns.
- The wetting agents should help remove any oily soil.
- The desensitizing salts must reestablish the hydrophilic surface which will strongly attract water.

### Water Leveling

Printing is a very dynamic process, especially on newer high-speed web presses. Conditions at the important printing nips are very different from a beaker sitting in the laboratory. This is the main reason that so-called "models" of press conditions often fail to duplicate working results. An example of this was the "first generation" alcohol substitutes that looked promising in the lab but worked very poorly on press. Their designers failed to consider the dynamic requirements.

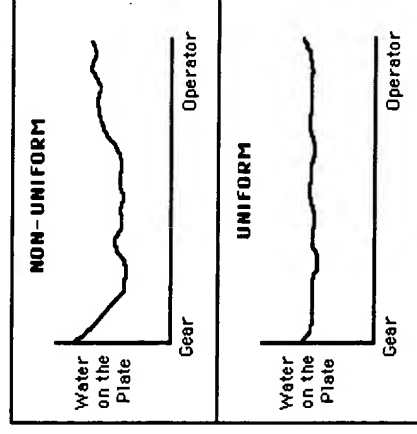
The dampening assignment is deceptively simple: rapidly lay down a thin, uniform film of water across the plate surface. Press engineers have worked hard to mechanically improve over the original conventional ductor design of the dampening train. They have tried sleeves, sprays, brushes, slip nips, oscillators, etc. to help provide a more uniform water film.

## WATER FLOW

### A Uniform Film

Two requirements must be met to obtain a uniform film:

1. At the instant the water form roller and the plate split, the ratio of wettest to driest areas must be a minimum across the plate.
2. Any surfactant in the fountain solution or alcohol substitute must be capable of acting very quickly to allow for the maximum leveling that is possible.



This plate is going to be very tricky to run, because the dampening system has laid down a film of widely varying thickness. This film will never be able to flow out in time.

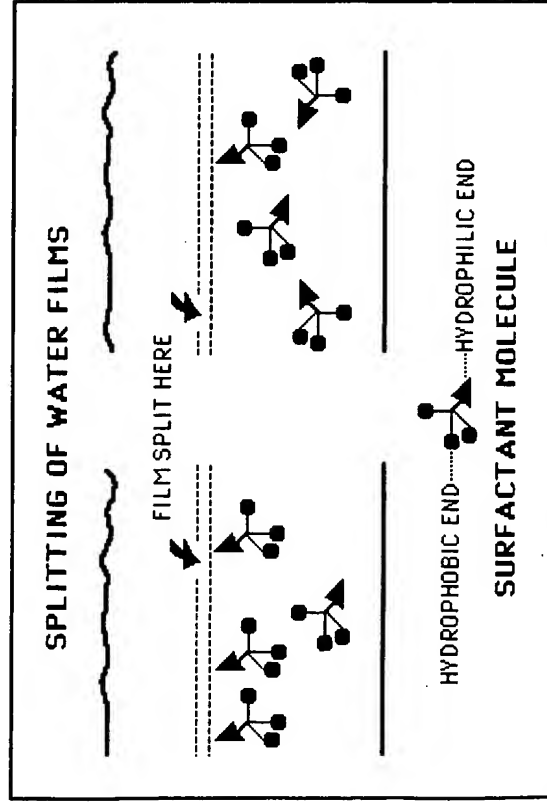
This plate, however, has taken a fairly even charge of water and will be easy to run.

The plate must be dampened sufficiently to prevent scumming in the driest area. If the film is uniform, the overall amount of water reaching the plate will be a minimum; and ink/water balance will be easiest to obtain.

## WATER FLOW

### Dynamic Surface Tension

Any surfactants that are in the fountain solution must be capable of acting very quickly. This is called good "Dynamic Surface Tension Reduction." When a water film is split (at the nips, for example) these surfactant molecules react by traveling (migrating) to a water surface. To be effective, the molecules must line up with their hydrophilic ends pointed towards the surface. They have no effect while inside the body of the liquid.



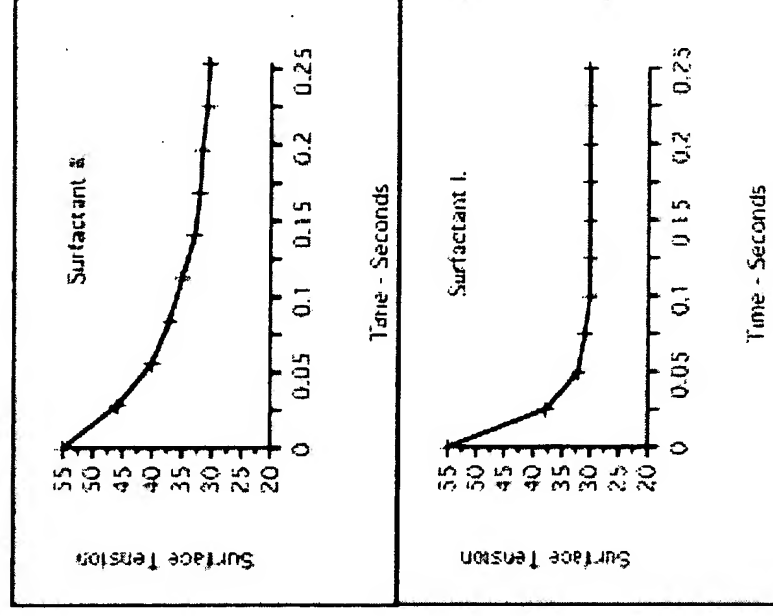
Observe on the left how the molecules have lined up quickly with their hydrophilic ends pointed to the fresh surface. On the right most of the molecules are still floating around randomly, and there will be little surface tension reduction of this film, because the molecules were too slow to reach the new surface.

## WATER FLOW

### Dynamic Surface Tension

—continued

The strength and concentration of the surfactant controls how much the surface tension will be reduced, but of greater importance the "migration speed of the molecules" controls how quickly the reduction or rapid wetting will occur on press.



Observe how both solutions reach a surface tension of 30, but that in the first graph (Surfactant I) it takes so long that at faster press speeds this will not be effective. Surfactant A is effective after only 0.05 seconds and will work well at highest speeds.

## WATER THROUGHPUT

The other important aspect of dampening flow is what we call "**Water Throughput**." This term describes how easily the fountain solution will move from the water pan through the dampening train and finally onto the plate. This is of primary importance with the continuous flow/alcohol type dampening systems. Alcohol's main function is to promote higher "throughput" and level water films. Both surfactants and viscosity builders in fountain concentrates will increase water flow and thus imitate the performance of alcohol.

Increasing the **viscosity** implies making the solution "thicker" and that seems contrary to the common sense notion of "making the water wetter or thinner" so that it will pass the metering nip more easily. However, as the viscosity increases, the water film at the rubber roller surface will be dragged through the nip more effectively. Think of it as trying to wipe off a film of 90 weight gear oil versus paint thinner.

### Alcohol

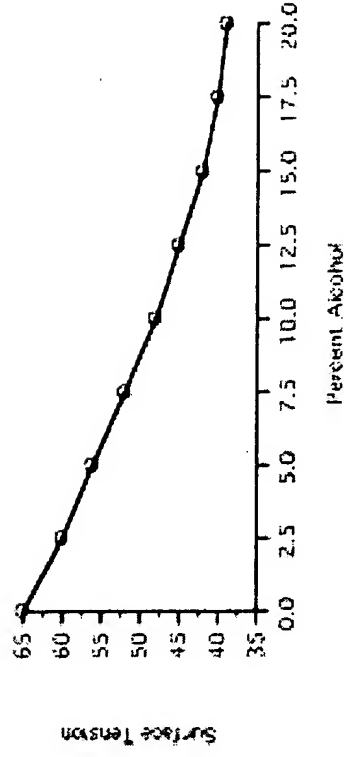
Let's briefly examine alcohol and why it is used so frequently. Common sense tells you that alcohol makes the "water wetter" and improves dampening flow. The following facts will help to explain why alcohol is so popular and seems to solve a myriad of press problems:

- Alcohol is a weak wetting agent.
- Alcohol evaporates from the ink train quickly, leaving no residue.
- The evaporation helps cool the ink train.
- The viscosity of water increases as IPA is added (up to about 25% alcohol concentration by volume).
- Alcohol is used at high percentages compared to other fountain ingredients.

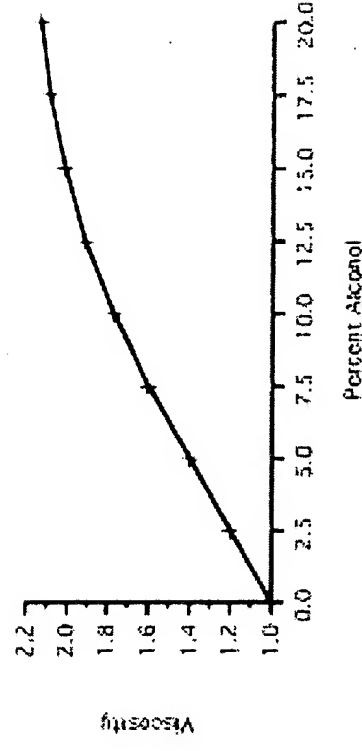
## WATER THROUGHPUT

### Alcohol

—continued



Alcohol gives only medium surface tension, but, because the molecules are small, it's dynamic properties are exceptionally good. Recall the migration diagram—there are 100 to 200 times as many alcohol molecules near a fresh surface than the surfactant molecules in an alcohol substitute. What this means is that alcohol, because of its high use level, will give very fast surface tension reduction. Successful alcohol substitutes mimic the surface and viscosity behavior of alcohol closely.

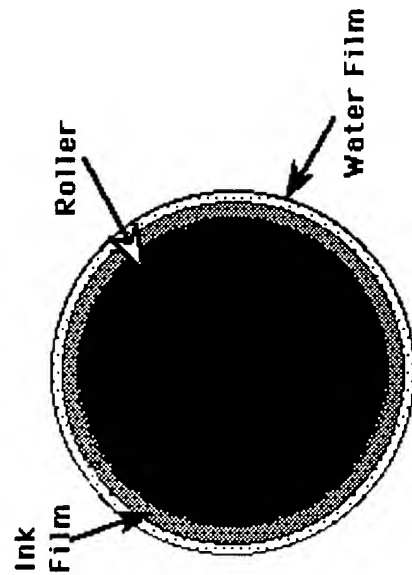


## LUBRICATION

Running a thin film of fountain solution over the plate surface, blankets, and rollers prevents excess friction, heat, and wear. Several additives such as alcohol substitutes, polymers, and glycols are used in fountain solutions to enhance the lubricating effect of water.

Without adequate lubrication between the plates and the form rollers there would be tremendous friction and rapid plate wear. We must also prevent the blankets from becoming too tacky (sticky) thus pulling off paper fibers, which is known as **picking**.

Recall the **water-in-oil** emulsion formed when the dry ink picks up fountain solution. As the plate passes under the forms some water is squeezed back out of the ink providing a cushioning effect between the roller and the plate. If the forms are not turning at exactly plate speed (which they usually won't be), the ink/water cushion provides slip preventing friction wear.

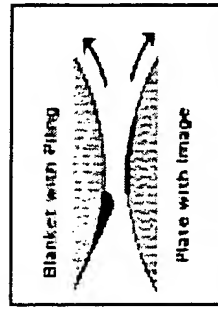


The rollers are covered by a film of both ink and water. This provides the vital slip needed to prevent wear.

## PILING AND LINTING

### Piling

One definition of **piling** is—a build up of ink (or ink components) and paper linters, generally on the blanket. This is a major concern for web printers because of the waste generated each time that the blankets must be cleaned. As these materials build and the blanket thickness increases in local areas, print quality will deteriorate. You will generally see this build up in the non-image area of the blanket, and it tends to be worst at the trailing edge of solids.



When the piling becomes thicker, the trailing edge of the image will begin to lift off the blanket and stop printing. Piling is a very good indicator of fountain solution, ink, and paper compatibility. On good stock, the blankets may only require cleaning every 200,000 impressions. The image does not usually pile, because fresh ink is constantly being transferred from plate to blanket to paper. This constant transfer tends to prevent any significant accumulation of foreign material on the blanket.

There are several contributing factors that influence the rate of piling:

1. The amount of water being carried on the plate/blanket. Running too dry generally increases the rate of piling.
2. The "speed" of the inks. Inks formulated with faster oils may tend to dry out and pile rapidly.
3. The lubricating ability of the fountain solution.
4. The type of plate used (smooth grain plates usually pile less).
5. Paper surface—loose fiber may be pulled off and added to the accumulated ink resin.

## PILING AND LINTING

### Linting

**Linting** is caused by stock with loose surface fibers or by excessive tack of the ink or blanket. Paper fibers are pulled off the sheet and then build up on the blanket. "Release Agents" are often included in fountain solutions or alcohol substitutes to decrease the "tackiness" of the blanket surface and reduce the tendency to pull the fibers off the sheet. Typical non-piling additives are made from glycols that will tend to keep the blanket moist.

Some printers will run paper that has loose surface fibers through a dummy unit before laying down the first color. Some of the loose surface fibers will be pulled off and stick on the dummy blanket reducing linting in subsequent units.

## EMULSIFICATION

### Emulsification of Fountain Solution into Ink

Ink must take on water to work correctly. This statement may seem contrary to intuitive thinking; however, the water film that is always covering the ink on the rollers must have some place to go. Part of the water passes into the ink, improving the flow and transfer characteristics. Of concern is *how much* water and exactly *how* is the water *distributed* while in the ink. The term **Emulsion** means a two phase system of liquids that do not chemically combine or dissolve into each other. If you looked at the ink on the forms under a microscope, you would see droplets of water suspended in the ink.



Ink I. will print smoothly with a fine grain structure. Ink II. will be snow-flaky or print with an "orange peel" look. Whenever ink is squeezed at the printing nips, these large (loosely held) water droplets will come back out of the ink and show up as voids in the image.

If the ink is too dry (low water pickup) or the water too tightly held, there will be problems with scumming or filling in of reverses. The water to keep the reverses or trailing edges of solids desensitized must come from the ink. Picture the water being compressed into the ink during the form roller squeeze and then popping back out after the image has passed the form roller.

The fountain solution should *not* encourage the ink to emulsify into the water phase.

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☒ **FADED TEXT OR DRAWING**

☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**

☐ **SKEWED/SLANTED IMAGES**

☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**

☐ **GRAY SCALE DOCUMENTS**

☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**

☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**

☐ **OTHER:** \_\_\_\_\_

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